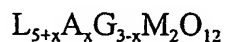


Claims

1. Solid ion conductor, characterized in that it has a garnet-like crystal structure and that it has a higher ion conductivity than 3.4×10^{-6} S/cm.
2. Solid ion conductor, characterized in that it has a garnet-like crystal structure and that it has a stoichiometric composition which is formally derived by aliovalent substitution of $\text{Li}_5\text{La}_3\text{M}_2\text{O}_{12}$ in which M is Nb or Ta.
3. Solid ion conductor, characterized in that it has a garnet-like crystal structure and that it has a stoichiometric composition $\text{L}_{5+x}\text{A}_y\text{G}_z\text{M}_2\text{O}_{12}$, wherein
L is in each case independently an arbitrary preferably monovalent cation,
A is in each case independently a monovalent, divalent, trivalent or tetravalent cation,
G is in each case independently a monovalent, divalent, trivalent or tetravalent cation
M is in each case independently a trivalent, tetravalent or pentavalent cation,
 $0 < x \leq 2$, $0 \leq y \leq 3$, $0 \leq z \leq 3$ and
wherein O can be partially or completely replaced by divalent and/or trivalent anions such as e.g. N^{3-} .
4. Solid ion conductor as claimed in any of the previous claims, wherein the stoichiometric composition is



and wherein

$$0 < x \leq 1,$$

L is a monovalent alkali metal cation,

A is a divalent metal cation,

G is a trivalent cation and

M is a pentavalent cation.

5. Solid ion conductor as claimed in claim 3 or 4, wherein L is selected from Li, Na and K can in each case be the same or different.
6. Solid ion conductor as claimed in claim 5, wherein L is Li.
7. Solid ion conductor as claimed in one of the claims 3 to 6, wherein A is selected from divalent cations preferably alkaline earth metal ions.
8. Solid ion conductor as claimed in any of claims 3 to 7, wherein M is selected from transition metal ions.
9. Solid ion conductor as claimed in any of claims 3 to 8, wherein A is selected from Ca, Sr and/or Ba and wherein M is selected from Nb and Ta.
10. Solid ion conductor as claimed in claim 8 or 9, wherein A is selected from Sr and Ba and wherein M is Ta.
11. Solid ion conductor as claimed in any of claims 3 to 10, characterized in that it is stable towards elemental lithium at lithium activities corresponding to a voltage of 5 V.
12. Process for producing a solid ion conductor as claimed in one of the previous claims, characterized in that salts and/or oxides of L, A, G and M are reacted together.

13. Process as claimed in claim 12, characterized in that the reaction takes place in a solid phase reaction.
14. Process as claimed in any of claims 12 or 13 for the production of a solid ion conductor as claimed in claim 4, characterized in that L and A are used in the form of nitrates, carbonates or hydroxides and are reacted with G_2O_3 and M_2O_5 .
15. Process as claimed in any of claims 12 to 14, which comprises the following steps:
 - (a) mixing the starting materials and ball-milling, preferably using zirconium oxide balls in 2-propanol,
 - (b) heating the mixture from (a) in air for 2-10 h to 400-1000°C;
 - (c) ball-milling, preferably using zirconium balls in 2-propanol;
 - (d) pressing the mixture with isostatic pressure into pellets; and
 - (e) sintering the pellets covered with a powder of the same composition for 10-50 h at 700-1200°C.
16. Process as claimed in claim 15, wherein
in step (b) the mixture is heated for 6 h to 700°C; and
in step (e) the pellets are sintered for 24 h at 900°C.
17. Use of a solid ion conductor as claimed in any of claims 1 to 11 in batteries, accumulators, supercaps, fuel cells, sensors and/or electrochromic devices such as windows, screens and facades.
18. Use as claimed in claim 18, wherein the solid ion conductor is used in the form of pellets, as a thin layer, in a crystalline or amorphous form.